Isotherm and Kinetic Studies of L-Phenylalanine Adsorption onto Porous Nanosilica

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Abstract

Porous nanosilica material was synthesized using tetraethyl orthosilicate as the silica source and ethanol as solvent under basic condition. The product was characterized by a number of techniques, including single point BET nitrogen adsorption, field emission scanning electron microscope (FESEM) and point of zero charge (pH_{PZC}) by mass titration. Results of the studies confirmed the porous structures of the nanoparticles. The adsorption capacity of L-phenylalanine under optimized condition of pH 5.37 with 0.1 mol/L concentrations of L-phenylalanine and 2 hour contact time by using 40 mg of silica nanoparticles is 748.9 μg/g. Equilibrium data were modeled using the Langmuir and the Freundlich isotherms and both models fit well with the experimental data which suggest chemisorption and physisorption reaction. For kinetic studies, the pseudo-second-order equation was the best-fit model for describing the adsorption process.

Keywords*:* L-phenyalanine; adsorption; silica nanoparticle